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AUTHOR	Klavora, Peter
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ABSTRACT

Changes in pre-competition state anxiety of junior and senior high school football and basketball players were studied as a function of trait anxiety of these athletes and three experimental athletic environments characterized by stressful and non-stressful conditions. In response to the psychological stress associated with athletic competition, state anxiety significantly increased in all subjects. These rises in state anxiety were occurring between practice and regular season and playoffs. High Trait subjects exhibited significantly higher elevations in state anxiety than Low Trait subjects which was in agreement with Spielberger's Trait-State Anxiety Theory. Stressful athletic environments (regular season and playoffs) did not, as has generally been believed, differentially affect the state anxiety of both groups of subjects. Spielberger's State Anxiety Inventory successfully discriminated between practice and competitive athletic environments and was successfully used in assessing the presence and strength of state anxiety levels of athletes in these environments. (Author)

APPLICATION OF THE SPIELBERGER TRAIT-STATE ANXIETY THEORY AND STAI IN PRE-COMPETITION ANXIETY RESEARCH

PETER KLAVORA, Ph.D.

Assistant Professor
School of Physical and Health
Education, University of Toronto

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There has been a growing interest in applied research focused on investigating possible changes in anxiety of athletes as a function of time to competition (7, 8, 9, 13, 14) and examining specific anxiety-arousing situations in competitive sports and related physical activities (2, 6). In these studies, a whole variety of validated anxiety inventories (Cattell IPAT anxiety scale; Scheirer and Cattell IPAT-8 parallel form anxiety battery; Mandler and Sarason test anxiety questionnaire) along with a number of specific "self-constructed" anxiety inventories developed by the researchers themselves have been used in measuring state anxiety phenomena in athletes. State anxiety of participants in athletics and physical activities occurs in response to a very specific set of anxiety-arousing stimuli, i.e. athletic competition and/or participation in new physical environment. Thus, state anxiety is situationally determined and transitory in nature. It is in distinct contrast to the trait anxiety construct which represents a generally acquired behavioral disposition which is relatively stable condition of an individual. In an excellent review of this subject area Martens (11) brought up numerous methodological weaknesses inherent in this type of research in competitive sports and physical activities. The major problem, it seems, stemmed from the fact that there was no appropriate theoretical model which would account for both types of anxiety experienced by participants, state and trait anxiety, and that there were no appropriate instruments available which would measure them. Since this research failed to distinguish between situational anxiety and anxiety proneness, considerable semantic confusion and equivocal research results have been produced. Namely, the instruments basically designed to

assess trait anxiety (IPAT anxiety scale, IPAT-8 parallel form anxiety battery) have been used wrongly in assessing state anxiety. Other, "self-constructed" anxiety inventories designed for measuring specific anxiety in subjects, lacked sufficient validity and reliability which added to the scepticism regarding the results of this research.

Recent developments in anxiety theory, particularly the Spielberger Trait-State Anxiety Theory, have a vast potential in improving the research on anxiety of participants in competitive sports and related physical activities. In this theory, two different anxiety constructs are defined as State anxiety and Trait anxiety. State anxiety is conceptualized by Spielberger (17:39) as "... . a transitory emotional state or condition of the human organism that varies in intensity and fluctuates over time. This condition is characterized by subjective, consciously perceived feelings of tension and apprehension, and activation of the autonomic nervous system." Furthermore, State anxiety will be low in non-stressful and non-threatening circumstances in which an existing danger is not perceived as threatening. It will be high in circumstances that are perceived by an individual to be threatening.

Trait anxiety, on the other hand, ". . . refers to relatively stable individual differences in anxiety proneness. . ." (17:39), i.e., the disposition to respond with State anxiety in situations which are appraised by the individual as threatening.

Furthermore, in Spielberger's framework of anxiety, stressor stimuli that evoke psychological threats to self-esteem and produce differential levels of State anxiety in persons are given special consideration. High Trait anxiety individuals are, in this contest, described as more self-deprecatory and as persons who fear failure. Therefore, they are hypo-

thesized to manifest higher levels of State anxiety in situations that involve psychological threats to self-esteem. Since it is reasonable to assume that athletic competition is one such stressor stimulus to all participants, this hypothesis should also hold in an athletic environment.

It is important to note that another variable has been added to the research on anxiety of athletes. This variable, State anxiety of the person, is transitory in nature and is characteristic of an athlete in terms of his attitude towards stressful competitive situation. For this reason, a new instrument of measuring State anxiety would seem to be necessary; a measure that would attend to both the dispositional and situational reactions of an athlete in stressful and non-stressful situations.

Spielberger (18) has recently developed an inventory, STAI (State-Trait Anxiety Inventory) with two separate scales which measure situational State anxiety and dispositional or Trait anxiety.

The purpose of this study was twofold: 1. To assess the power of STAI in discriminating State anxiety levels of athletes in non-stressful and stressful athletic environments; 2. To examine the validity of Spielberger's Trait-State Anxiety Theory in competitive athletic environment. The theory predicts differences in State anxiety in individuals who differ in Trait anxiety.

Method

Over 300 high school football and basketball players who participated in the 1973/74 Edmonton Senior and Junior High Schools' Football League and the 1973/74 Edmonton Senior High Schools' Boys Basketball League, were the subjects (Ss) of this study. At the senior football level, two city

regional divisions, South and North, were played. Since the investigator wanted to include only those teams from the two divisions that had a fair chance to make the playoffs, the selection of three North side teams and four South side teams was based on the pre-season predictions of the strength of the teams by the coaches and sports writers in the Edmonton daily newspaper, the Edmonton Journal. The three junior football teams were included only because the respective head coaches expressed interest in this research and wanted to be included. In total, 15 Senior and 15 Junior teams participated in the two leagues. There were eight Regular Season games played. In contrast, the basketball data were collected starting at the mid-point of the Regular Season with eight games remaining. Out of 16 competing teams, 14 participated in the present research.

The design of the study called for repeated administration of STAI State anxiety scale to all Ss in three different experimental athletic environments which were either stressful or non-stressful in nature: Practice environment, Regular Season competitive environment, and Playoff competitive environment. The criterion for a stressful condition was that the State anxiety scale was administered to the Ss approximately one half hour or less before the game in the locker room where the Ss were changing. The test was administered for the most part within minutes of actual competition. The criterion for a non-stressful condition was that the testing was done during a practice session at least one week before any competitive game situation. Generally, only two attempts were made to secure Practice State anxiety scores. Since some of the Ss Skipped practice on the day of the test administration, only one Practice State anxiety score was available on these Ss for statistical treatment. STAI Trait anxiety scale was,

however, typically administered at regular team meetings in the classroom or locker room environment before commencement of the Regular Season. The retest on Trait anxiety scale was administered to most of the Ss during the playing season or immediately after the season.

Although it was hoped to secure the information on State anxiety of all Ss from all the games they played, this was not possible to achieve. The most common reasons for missing some data were: 1. S forgot to fill out the questionnaire; 2. S quit the team during the season; and 3. there was not enough time to fill out the questionnaire. The following criteria were used in selection of Ss for statistical analysis: Ss who failed to obtain four or more State anxiety scores during Regular Season and Ss who failed to qualify for the Playoffs were excluded from further research. Due to the single game elimination competition in the Playoffs, one or more State anxiety scores for each S were necessary if the S was to be included in further analysis. The only exception to this were Ss involved in Junior football. None of the three teams included in this research qualified for Playoff competition; therefore, only the effects of two experimental conditions on State anxiety of these Ss were investigated.

Since typically, more than one State anxiety score was obtained for each S in any one of the experimental conditions, the S's mean State anxiety value for each experimental condition was computed. These mean State anxiety values were then treated statistically with a series of two factor ANOVA with repeated measures on one factor. Changes in mean State anxiety values as a function of Trait anxiety and experimental conditions were also presented schematically. Conclusions of the study were based on the .01 probability level of significance.

Two Trait anxiety groups of Ss were studied: high Trait anxiety Ss (HT Ss) and low Trait anxiety Ss (LT Ss). These two groups were differentiated on the basis of the mean Trait anxiety computed for the respective groups of Ss examined in this study. Since some of the Ss were retested on Trait anxiety, the mean values were used in statistical analysis.

Results

The effects of Trait anxiety and Experimental Conditions on State anxiety were evaluated in Table 1. In Figure 1, changes in State anxiety for HT Ss and LT Ss were plotted as a function of the Experimental

Insert Table 1

Conditions at two levels of competition in football and one level of competition in basketball. All graphs demonstrate differences between the

Insert Figure 1

two groups of Ss with the HT graphs running higher than LT graphs in all Experimental Conditions. These differences were all significant as indicated by significant F values for Trait anxiety in Table 1.

All HT and LT graphs do show a sharp increase in State anxiety from their low in Practice and level off at Regular Season and Playoffs (as indicated earlier, there were no Playoff scores available for Junior football). These changes in State anxiety were all significant (see Table 1: all F values for Experimental Conditions were highly significant) with the significance lying between Practice and Regular Season. This was also indicated by Scheffe's post hoc multiple comparison analyses.

Discussion

The results of this study indicated that athletic competition is a stressful environment to the participants. It evoked significant elevations in State anxiety immediately prior to the contest. It was consistently observed that significant rises occurred between Practice and Regular Season, but stabilized over the two stressful competitive conditions, Regular Season and Playoffs. This observation is in agreement with previous research (3, 4, 5, 7, 9, 12) which demonstrated changes in anxiety, emotional stresses, and reactions in athletes in competition which were measured with several different psychological instruments.

Tutko has, on the basis of clinical research, speculated, contrary to the results of this study, that ". . . the more crucial the contest, the higher the degree of anxiety." (19:917). Intuitively, Playoff competition may be regarded as a more crucial contest than Regular Season competition because it decides the eventual winner. Every contest is important and by losing, further competition is terminated. Additionally, only the best teams remain and winning becomes progressively more difficult. Therefore, the longer a team (or a player) stays in Playoff competition the greater, it would appear, is the psychological threat of such competition to the individual members of the team. The same reasoning would apply to championship contests and tournaments. The results of the present study, however, contradict Tutko's speculation since State anxiety in Senior High School football and basketball where Playoffs occurred, did not demonstrate any changes from Regular Season competition to Playoff competition.

To reconcile the obvious disagreement between the results of this study and Tutko's speculation, another variable, playing performance of the

athlete in such psychologically intensified conditions, has to be introduced. The most popular concept to explain the relationship between anxiety and motor performance in athletics has been the inverted U concept (1, 15, 16) which has in turn been explained in terms of Duffy's arousal theory. These theories suggest that there is an optimal activation or emotional arousal point (or possibly a range) at which an individual performs well. When one experiences a higher or lower activation level which obviously differs from the optimal level, then the performance of this individual is impaired. Theoretically, then, although elevation in State anxiety in Playoffs and other championship competitions over and above the optimal level required by the inverted U hypothesis is quite possible, it is elevated at the expense of a decrease in performance. The results of this study suggest that the relationship between pre-competition State anxiety and performance of athletes is a stable one. Once it is established during the Regular Season, it is maintained throughout Playoffs. This finding is thus in disagreement with Tutko's speculation and agrees with Singer who states that ". . . the highly proficient athlete is one who demonstrates not only superb skills, but also emotional control under all sorts of circumstances." (16:125).

In Figure 1, significant differences in State anxiety between the LT Ss and HT Ss over the experimental conditions are demonstrated. These differences are significant in all three instances. These results were in agreement with Spielberger's Trait-State Anxiety Theory and confirmed the general notion of leading sport psychologists (1, 15, 16) that HT Ss are liable to show higher elevations in pre-competition State anxiety than LT Ss. Furthermore, it is interesting to note that the vertical differences in State anxiety between the LT Ss and HT Ss remained very stable. In competitive situation both

groups' State anxiety increased by the same amount on the State anxiety scale. It could be argued that since the HT Ss did, throughout the competitive season, remain on the respective teams, they must have most likely done their assignments satisfactorily. This indicated that an increase in State anxiety from its practice level was preferable for both groups, LT Ss and HT Ss, in competitive situation. This indicated that an increase in State anxiety from its practice level was preferable for both groups, LT Ss and HT Ss, in competitive situation. This agreed with Singer's statement that ". . . a certain amount of anxiety acts to prepare the athlete for competition." (16:127). The practical implications of this observation are important, because it is generally believed that HT athletes are easily aroused and in competition tend to be over-aroused, whereas the opposite is true for LT Ss. Therefore, HT Ss have to be calmed down and LT Ss have to be activated for the purpose of bringing both groups to an optimal level for an optimal performance (16:127). The fact that HT Ss did stay on the team suggests that their performance was not impaired by elevations in State anxiety prior to competition. On the contrary, they performed just as well as did LT Ss. This suggests that LT and HT Ss do not follow the same inverted U curve as has been traditionally assumed, but that there are at least two such curves, one for the HT Ss and one for the LT Ss. The two curves are placed at different levels on a State anxiety scale continuum. Thus, differential pep talks, one for the LT Ss and one for HT Ss, as often suggested in athletics, would seem to be redundant. However, this does not imply that an over-excited athlete performing very poorly is not a possibility. This athlete would, of course, have to be approached on an individual basis.

From aforegoing it is clear that the STAI State anxiety scale successfully measured the presence and strength of State anxiety levels of Ss in

non-stressful and stressful competitive athletic situations. When maintaining the conceptual distinction between State and Trait anxiety, STAI seems to be the only appropriate tool for research purposes, particularly in investigations similar to the present one, where measures of State anxiety were obtained repeatedly over longer periods of time with the same Ss. According to Levitt, "STAI is the most carefully developed instrument, from both theoretical and methodological standpoints." (10:71). Martens (11) has expressed similar satisfaction and has recommended the instrument in this type of research. Furthermore, the test construction procedures described by the originators (18) are highly sophisticated and rigorous. The validating data on the STAI presented by Spielberger et al (18) are clearly in accord with Spielberger's conception of Trait-State Anxiety Theory. Items contained in both scales have high item remainder correlations with the total scale. The test - retest correlations for the Trait anxiety scale are reported reasonably high, ranging from .73 to .86 while those for the State anxiety scale are reasonably low, ranging from .16 to .54. The low r's for the State anxiety scale were anticipated, ". . . because a valid measure of State anxiety should reflect the time of testing." (18:9). The STAI State anxiety scale was designed to measure specific situational anxieties and as such it has proved to be very useful in studying the presence and strength of pre-competition anxiety in athletes. The STAI.State anxiety scale is brief, easy to administer and is recommended for repeated testings. This makes the instrument particularly attractive for similar research in real life situations where an in-depth study of specific anxiety-arousing situations in competitive sports and their influence on motor behavior is investigated.

Conclusions

The major findings and conclusions of the study were:

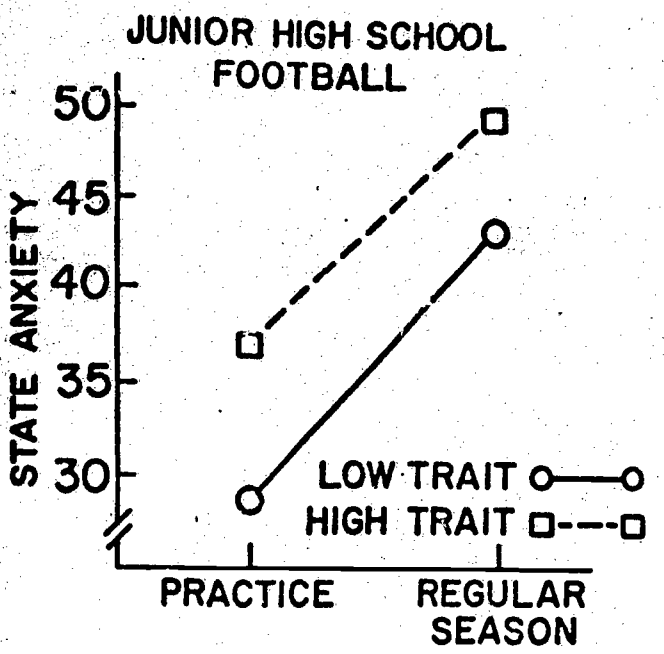
1. In response to the psychological stress associated with athletic competition, State anxiety significantly increased in all Ss. These significant rises in State anxiety were occurring between Practice and Regular Season athletic environments. Over the two competitive Experimental Conditions, Regular Season and Playoff environments, State anxiety showed stability on senior level of competition.
2. High Trait Ss exhibited significantly higher State anxiety levels than Low Trait Ss over all Experimental Conditions.
3. STAI was successfully used in measuring the presence and strength of State anxiety levels of Ss in non-stressful and stressful athletic environments.

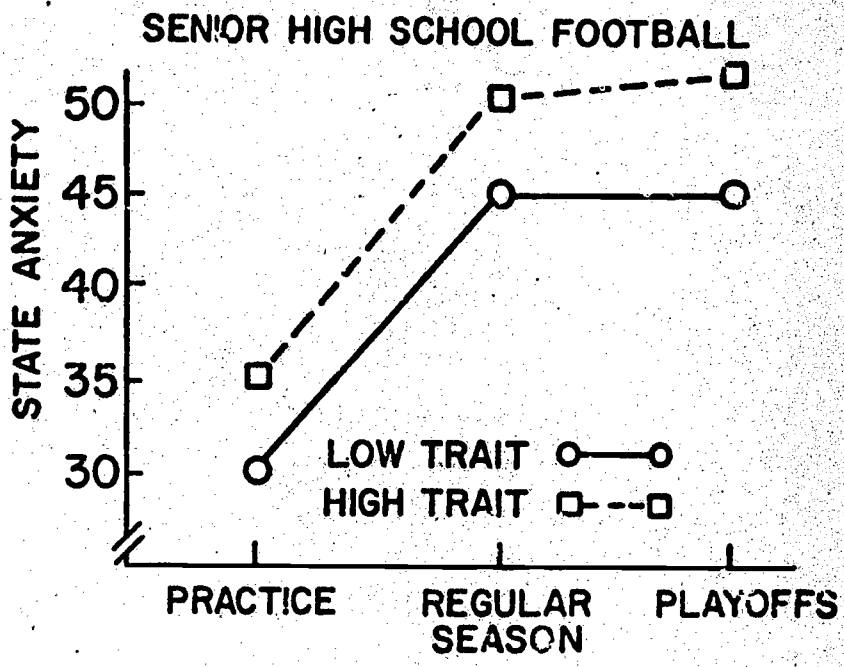
Table 1: Summary of the analyses of variance of the effects of the experimental conditions on pre-competition State anxiety for high Trait anxiety Ss and low Trait anxiety Ss.

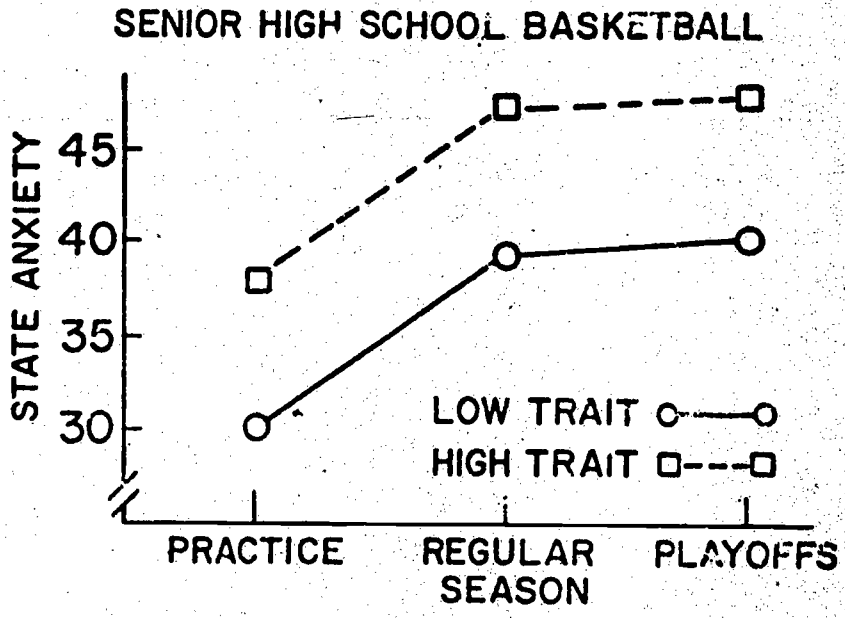
Level and Sport	Source of Variance	df	MS	F
	A-Trait (A)	1	2,278.4	37.58*
Junior High	Error (b)	90	60.6	
Football	Conditions (C)	1	8,348.4	153.11*
	A x C	1	64.6	1.19
	Error (w)	90	54.5	
	A-Trait (A)	1	1,472.8	15.04*
Senior High	Error (b)	64	97.9	
Football	Conditions (C)	2	5,003.2	126.31*
	A x C	2	9.5	0.24
	Error (w)	128	39.6	
	A-Trait (A)	1	4,199.0	35.14*
Senior High	Error (b)	94	119.5	
Basketball	Conditions (C)	2	2,915.9	95.31*
	A x C	2	0.6	0.02
	Error (w)	188	30.6	

* significant at .01 level

Figure 1: Pre-competition State anxiety scores for high Trait anxiety Ss and low Trait anxiety Ss as a function of the Experimental Conditions.


JUNIOR HIGH SCHOOL
FOOTBALL
STATE ANXIETY
50
45
40
35
30
LOW TRAIT
HIGH TRAIT
PRACTICE
REGULAR
SEASON


SENIOR HIGH SCHOOL FOOTBALL
STATE ANXIETY
50
45
40
35
30
LOW TRAIT
HIGH TRAIT
PRACTICE
REGULAR
SEASON
PLAYOFFS


SENIOR HIGH SCHOOL BASKETBALL
STATE ANXIETY
45
40
35
30
LOW TRAIT
HIGH TRAIT
PRACTICE
REGULAR
SEASON
PLAYOFFS

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